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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/593,866

09/22/2006

Akihiro Morikawa

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EXAMINER

SANGHAVI, HEMANG

ART UNIT

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/593,866	Applicant(s) MORIKAWA ET AL.	
	Examiner HEMANG SANGHAVI	Art Unit 2874	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-34 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-34 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____. |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>9/22/06 and 11/14/07</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

The preliminary amendment filed on September 22, 2006 has been entered.

Priority

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

The prior art documents submitted by Applicant(s) in the Information Disclosure Statement(s) filed on 9/22/06 and 11/14/07 have all been considered and made of record (note the attached copy of form(s) PTO-1449).

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 33 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In lines 3-5 of claim 33, the phrase "an electric charge of at least 100 times 2PsA, where Ps is the spontaneous polarization and A is the domain inversion surface area, is applied" renders the claim indefinite, since there is no antecedent basis for the "the domain inversion surface area" and it is unclear as to how the spontaneous polarization is measured and what is the unit for such measure.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-12, 14-28, 30-32, and 34 are rejected under 35 U.S.C. 102(b) as being anticipated by Gupta et al (US 5,756,263).

Gupta et al discloses an optical element comprising: a single-polarized ferroelectric substrate (10); a plurality of domain inversion regions formed in the ferroelectric substrate; and a grooves (27) formed on the surface of the ferroelectric substrate between the domain inversion regions; wherein the depth T' of at least one of the domain inversion regions satisfies the relation $T' < T$ with respect to the substrate thickness T . See Figs. 5a-5b and lines 40-59 of column 6.

As to claims 2-3, as can be seen in Figs. 5a-5b, at least 90% of the plurality of domain inversion regions (where the grooves are placed) satisfies the relation $T' < T$.

As to claims 4-5 and 21, in lines 55-58 of column 7, Gupta et al teaches to provide the photoresist pattern with a 3.6 μm period to etch the grooves, constituting the spacing and width of the domain inversion region less than 5 μm .

As to claims 6 and 22, in lines 26-27 of column 7, Gupta et al teaches to provide a z-cut substrate of 0.5 mm thickness.

As to claim 7, see lines 21-22 of column 7, revealing the domain structure in Y-axis.

As to claims 8-9 and 25-26, Gupta et al discloses the depth of the groove is 0.5 μm meeting the claimed limitations (see lines 59-60 of column 7).

As to claim 14, Gupta et al discloses a method of forming domain inversion region in the interior of a single ferroelectric crystal substrate including the steps of providing a groove to the surface of the ferroelectric substrate and dividing the surface of the ferroelectric substrate into a plurality of regions; and applying an electric field to the plurality of regions and forming domain inversion regions, wherein the direction of the electric field is a direction facing the spontaneous polarization of the ferroelectric substrate, and in the step of applying the electric field, a potential difference is produced in the plurality of regions. See lines 50-59 of column 6.

As to claims 16-18, Gupta et al teaches to provide a control voltage and also teaches two distinctive voltages corresponding to polarization reversal of region 1 and region 2. See lines 58-60 of column 6.

As to claim 19, Gupta et al teaches to provide the step of applying electric field with a dc ramp of approximately 100 to 200 volts per second to 10 kv at which the time the ramp was decreased to 10 to 30 volts, constituting the change of at least 1 kv/second.

As to claim 24, see claim 7 of Gupta et al.

As to claims 11-12 and 31-32, Gupta et al substantially discloses the claimed substrate and it would be inherent that the angle formed by the normal line of the ferroelectric substrate and the spontaneous polarization of the ferroelectric substrate is no more than 30°.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 13 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gupta et al.

Gupta et al, as discussed above, fails to disclose magnesium doped $\text{LiTa}_{(1-x)}\text{Nb}_x\text{O}_3$ ($0 \leq x \leq 1$).

As noted in lines 55-56 of column 7, Gupta utilizes z-cut LiTaO_3 crystal substrate. The utilization of magnesium doped $\text{LiTa}_{(1-x)}\text{Nb}_x\text{O}_3$ ($0 \leq x \leq 1$) material for the ferroelectric substrate is well known in the art. Such mixed crystal requires a lower electric field for inducing domain inversion.

From available well known techniques, the ordinary artisan would have found it obvious at the time of the invention to utilize magnesium doped $\text{LiTa}_{(1-x)}\text{Nb}_x\text{O}_3$ ($0 \leq x \leq 1$) material for the substrate of Gupta et al for the purpose of reducing electric field requirements.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Kawaguchi et al and Mizuuchi disclose different types of optical elements including a ferroelectric substrate with a groove providing domain inversion regions.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to HEMANG SANGHAVI whose telephone number is (571)272-9955. The examiner can normally be reached on Mon-Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rodney Bovernick can be reached on (571) 272-2344. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2874

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Hemang Sanghavi/
Primary Examiner, Art Unit 2874

HS